Ames Procedural Requirements

APR 7150.2

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Directive Title: Ames Software Engineering Requirements

Responsible Office: Code P, Project Management and Engineering Directorate, Ext. 4-3340, Mail Stop 200-10

1. Purpose

The purpose of this Ames Procedural Requirement (APR) is to document the ARC procedures that will be used to confirm compliance with the following NASA Procedural Requirements (NPRs) and Standards:

NASA Procedural Requirements (NPR) 7150.2
NASA Software Assurance Standard (NASA-STD-8739.8)
NASA Software Safety Standard (NASA-STD-8719.13B)

This APR establishes the ARC software management and assurance practices and procedures to be utilized in software development, acquisition, and maintenance activities. The approach of this APR is to have projects perform software assessments according to both NPR 7150.2 and NASA-STD-8739.8. If the projects are either Software Class A or B, then they should follow the project requirements of NPR 7150.2 and NASA-STD-8739.8. If the projects are either Software Class C, D, or E, then they should follow the ARC defined project requirements in the included Appendices. If the project is also determined to have safety critical software, then the project should follow the requirements of NASA-STD-8719.13.

2. Applicability

This APR applies to all software created, acquired, or maintained by or for ARC, except for business and IT-infrastructure systems. For projects initiated prior to the approval of this APR, its application is left to the discretion of the Ames Technical Authority Advisory Council (ATAAC).

3. Authority

4. Definitions

4.1 Customer--Any organization or individual that enters into an agreement with ARC for services and/or products.

4.2 Customer Agreement--A document binding ARC and the customer to deliver a service and/or product for consideration. It contains all the customer requirements, period of performance, and responsibilities to carry out the agreement. For this APR, the Customer Agreement is another term for project plan(s).

4.3 Design--Process of translating user or customer requirements into a set of instructions or drawings that can be turned into a final product.

4.4 Development--The process of turning a design into a final product.

4.5 Integration--The process of combining all the components into a fully functional system meeting the customer's requirements.

4.6 Product--An item that performs the function it was designed for.

4.7 Project--NASA entity that has the NASA technical, schedule, and budget responsibilities to achieve the expected results. The project always acquires software from supplier(s). Within NASA, the project and supplier may be the same entity. In that case, a single activity may meet more than one APR requirement. The intent of this APR is that these are project requirements, which may include ensuring that the supplier complies with some of software engineering and software assurance requirements.

4.8 Project Manager--Individual responsible for the administration and technical direction of a project. This person is responsible for delivering the product to the customer on schedule, within budget, and meeting the requirements.

4.9 Safety--Freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment. Definition is from the NASA Safety Manual, NPR 8715.3.

4.10 Safety Critical--Term describing any condition, event, operation, process, equipment, or system that could cause or lead to severe injury, major damage, or mission failure if performed or built improperly, or allowed to remain uncorrected. Definition is from the NASA Safety Manual, NPR 8715.3.

4.11 Safety Critical Software--Software that contributes to the safety of a safety-critical system; see Determiniation of Safety Criticality Section.

4.12 Software--Computer programs, procedures, rules, and associated documentation and data pertaining to the development and operation of a computer system. Software also includes COTS, GOTS, MOTS, embedded software, reuse, heritage, legacy, auto generated code, firmware (instructions, logic, or associated data loaded into programmable devices), database, and open source software components. The definition is same as that in NASA Software Policy, NPD-2820.1C, except for the explicit inclusion of database.

4.13 Supplier--Entity that creates, maintains, and/or operates the software work products and/or services.

4.14 Validation--Proof that the product accomplishes the intended purpose. Validation may be determined by a combination of test, analysis, and demonstration.

4.15 Verification--Proof of compliance with specifications. Verification may be determined by a combination of test, analysis, demonstration, and inspection.

4.16 Ames Engineering Process Group (AEPG)-- The AEPG is a standing Centerwide committee which serves as a focal point for the Software Process Improvement (SPI) implementation activities at ARC. See Appendix H for the AEPG charter.

5. Responsibilities

5.1 **Center Director or his/her designee**:

- Signs the documentation committing the Government to the terms of the Customer Agreement.

5.2 **Division or Branch Chief**:

- Ensures that the Customer Agreement, project deliverable(s), costs, and schedule are consistent with available resources.
- Ensures that the ATAAC reviews and approves the Customer Agreement when the product operation can affect safety and reliability.
- Obtains concurrence by Chief Council if required.
- Approves the Customer Agreement.
- Reviews and approves project deliverables(s).
- Selects the Program/Project Manager.

5.3 **Program/Project Manager**:

- Formulates the customer agreement and requirements.
- Develops and implement the management tools needed to track the cost and schedule of the project.
- Tracks progress with respect to meeting requirements.

- Conducts reviews to appraise the customer and management as to the status of the project and any issues.
- Develops and performs the integrated system test to demonstrate functionality and compliance to the customer, including training the customer's workforce if applicable.
- Provides the customer with a full set of documentation including as-built drawings/code, and operations and maintenance manuals, as specified by customer agreement.
- Presents to the management and the customer, at the earliest possible time, recommended solutions to issues that may cause the cost, schedule, or functionality to be compromised.
- Completes software assessment
- Complies with software management and assurance requirements of this APR, based on software class, safety criticality, and assurance level,

5.4 **Chief Council**:

- Reviews the Customer Agreement for compliance to laws and statues governing such agreements.

5.5 **Ames Center Management Council (ACMC)**:

- Assesses Programs/Projects compliance of this APR.

5.6 Ames Technical Authority Advisory Council (ATAAC):

- Determines applicability of this APR to projects initiated prior to the approval of this APR.
- Review, approve, and modify software classification determination
- Make final software classification determination when there is disagreement between Program/Project Manager and AEPG

5.7 **Ames Engineering Process Group (AEPG)**:

- Review and concur software project classifications, assist projects in applying this APR, maintain the ARC Process Asset Library (PAL), and assist projects in utilizing the PAL.

5.8 Project Management and Engineering Director, Code P:

- Sponsors the AEPG, and approves the AEPG Charter.

5.9 The Safety, Environmental, and Mission Assurance Director, Code Q:

- Assures the safety, quality, and reliability of ARC software.

- Reviews project software processes and make recommendations to projects, Ames Center Management Councils, and Ames Technical Authority Advisory Council.

- Conducts oversight of ARC's software assurance programs.
- Conducts Compliance Verification audits of programs/projects to ensure compliance with this APR.
- Independently assesses project software management, engineering, and assurance practices.

6. References

APR 7120.5	Flight System Project Management
APR 7123.1	Flight Systems Project Reviews
APR 8040.1A	Configuration Management of Flight Systems
APR 8070.1	Engineering Requirements for Flight Systems
APR 8705.1	System Safety and Mission Assurance
NPD 2820.1C	NASA Software Policy
NPR 8715.3	NASA Safety Manual

7 Requirements

7.1 Software Engineering Requirements

All ARC software projects, whether a stand-alone activity or in support of a broader project, using either acquired software or in-house developed software, shall determine following four classifications:

1. Software Engineering NPR 7150.2 class,

2. Software safety criticality,

3. Software assurance level of effort,

4. Software implementation approach,

These classification determinations shall be made during the early or mission definition phase(see APR 7123.1 for Mission Definition Review) of the project; so that the project planning and/or the software acquisition activities include their software engineering requirements. The results of these determinations shall be documented in the report shown in Appendix A.

The project manager shall present the results of the classification determinations to the AEPG for concurrence during the early or mission definition phase of the project. If the AEPG does not

concur, the project manager and the AEPG shall engage in discussions directed toward resolving the disagreement. If the disagreement cannot be resolved between the project manager and the AEPG, the ATAAC will make the final classification determination. All classification determinations are reviewed, approved, or modified by the ATAAC.

Projects shall comply with the Software Enginering and Assurance Requirements Section according to their class, safety criticality, and assurance level.

7.2 Determination of Software Engineering NPR 7150.2 Class

The following software engineering classification is defined in NPR 7150.2, and is repeated below for convenience with the following modifications:

a. Removed "system safety" impact from Class D and E descriptions; if software is determined to be safety-critical, then NASA-STD-8719.13 would apply.
b. Added "provide decision support tools for non-mission critical situations" to Class D description.
c. Created Sub-Class E1

In the event of conflict, the definition in NPR 7105.2 takes precedence.

7.2.1. Class A - Human Rated Software

Applies to all space flight software subsystems (ground and flight) developed and/or operated by or for NASA to support human activity in space and that interact with NASA human space flight systems. Space flight system design and associated risks to humans are evaluated over the program's life cycle, including design, development, fabrication, processing, maintenance, launch, recovery, and final disposal. Examples of Class A software for human rated space flight include: guidance; navigation and control; life support systems; crew escape; automated rendezvous and docking; failure detection, isolation and recovery; and mission operations.

7.2.2 Class B - Non-human Space Rated Software

Flight and ground software that must perform reliably in order to accomplish primary mission objectives. Examples of Class B software for non-human (robotic) spaceflight include: propulsion systems; power systems; guidance navigation and control; fault protection; thermal systems; command and control ground systems; planetary surface operations; hazard prevention; primary instruments; or other subsystems that could cause the loss of science return from multiple instruments.

7.2.3 Class C - Mission Support Software

Flight or ground software that is necessary for the science return from a single (non-critical) instrument or is used to analyze or process mission data or other software for which a defect could adversely impact attainment of some secondary mission objectives or cause operational problems for which potential work-arounds exist. Examples of Class C software include:

software that supports prelaunch integration and test, mission data processing and analysis, analysis software used in trend analysis and calibration of flight engineering parameters, primary/major science data collection and distribution systems, major Center facilities, data acquisition and control systems, aeronautic applications, or software employed by network operations and control (which is redundant with systems used at tracking complexes). Class C software must be developed carefully, but validation and verification effort is generally less intensive than for Class B.

7.2.4 Class D - Analysis and Distribution Software

Non-space flight software. Software developed to perform science data collection, storage, and distribution; to perform engineering and hardware data analysis; or to provide decision support tools for non-mission critical situations. A defect in Class D software may cause rework, but has no direct impact on mission objectives. Examples of Class D software include software tools; analysis tools; and science data collection and distribution systems.

7.2.5 Class E - Development Support Software

Non-space flight software. Software developed to explore a design concept; or to support software or hardware development functions such as requirements management, design, test and integration, configuration management, documentation, or science analysis. A defect in Class E software may cause rework, but has no direct impact on mission objectives. Examples of Class E software include: earth science modeling; information only websites (non-business and non-information technology infrastructure); science data analysis; and low technology readiness level research software.

7.2.5.1 Class E1 – Exploratory Software

Class E1 is a sub-class of class E. If the answers to the following questions are "No", then the software may be classified as E1.

1) Will the software be released to others inside ARC, inside NASA, or externally to NASA? Release is defined as: to distribute a product intended for use outside of the development team for purposes other than exploratory software development.
2) Does the software enable, analyze, or verify a product that ARC intends to release within NASA or externally to NASA?
3) Is the software intended for use in a deliverable project, facility, or larger system?
4) Will this software be maintained or expanded after it is put to practical use?
5) Does this software pose a safety risk to personnel or a facility?
6) Would lack of documentation (e.g., management/development plan, requirements, design, test plans, test reports, version description, user manual) or configuration control of this software impair its use from the customer's perspective?
7) If this software was lost or made unusable, would it impact the ARC's missions and objectives?

7.3 Determination of Safety Criticality

The following determination is defined in NASA-STD-8719.13, and is repeated below for convenience. In the event of conflict, the definition in NASA-STD-8719.13 takes precedence. Software is considered safety-critical if it meets any of the following three criteria:

a. Resides in a safety critical system (as determined by a hazard analysis), and at least one of the following apply:
   1) Causes or contributes to a hazard.
   2) Provides control or mitigation for hazards.
   3) Controls safety-critical functions.
   4) Processes safety critical commands or data.
   5) Detects and reports, or takes corrective action, if the system reaches a specific hazardous state.
   6) Mitigates damage if a hazard occurs.
   7) Resides on the same processor as safety-critical software.

b. Processes data or analyzes trends that lead directly to safety decisions (e.g., determining when to turn power off to a wind tunnel to prevent system destruction).

c. Provides full or partial verification or validation of safety-critical systems.

Until proven otherwise based on the above criteria, software within a safety-critical system shall be considered to be safety-critical.

7.4 Determination of Software Assurance Level

If the software to be developed or acquired meets the criteria identified on the left of Table 7-1 below, then the corresponding software assurance level of effort on the right shall be assigned. If the software meets the criteria of more than one level, the highest level shall be assigned.

Table 7-1 Software Assurance Criteria

	Software Assurance Level of Effort				
	Full	**High**	**Medium**	**Low**	**Not Appli-cable**
Software Engineering NPR 7150.2 Class					
A	X				
B		X			
C			X		
D					X
E					X

	Software Assurance Level of Effort				
	Full	**High**	**Medium**	**Low**	**Not Appli-cable**
E1					X
Software Safety Criticality	X				
Potential for:					
Catastrophic Mission Failure: Loss of vehicle, or total inability to meet mission objectives	X				
Partial Mission Failure: Inability to meet one or more mission objectives		X			
Potential for waste of resource investment[1]:					
Greater than 200 work-years on software	X				
Greater than 100 work-years on software		X			
Greater than 20 work-years on software			X		
Greater than 4 work years on software					X
Less than 4 work years on software					X
Potential for impact to equipment, facility, or environment[2]:					
Greater than $100M	X				
Greater than $20M		X			
Greater than $2M			X		
Less than $2M					X

7.5 Determination of Software Implementation Approach

The choices are ARC created software, ARC acquired software, or ARC integration of acquired software. ARC created software, or in-house software development, may include the utilization of COTS, GOTS, and MOTS because the project is still responsible for implementing the requirements of this APR. ARC acquired software, or acquisition of software from another organization or company implies that the project is not performing software development and implementation. ARC integration of acquired software is the situation where the project will integrate an acquired software module/component into the final software product.

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[1] *Potential for waste of resource investment* is a measure or projection of the effort invested in the software over all life cycle phases.

[2] *Potential for impact to equipment, facility, or environment* is a measure of the cost of the physical resources that are placed at risk of damage or loss due to a software failure.

7.6 Software Engineering and Assurance Requirements

7.6.1 Class A Software
Class A software shall follow all of the requirements of NPR 7150.2 as specified therein. Please refer to the NPR for those requirements.

7.6.2 Class B Software
Class B software shall follow all of the requirements of NPR 7150.2 as specified therein. Please refer to the NPR for those requirements.

7.6.3 Class C Software
Class C software shall follow the requirements specified in Appendix B.

7.6.4 Class D Software
Class D software shall follow the requirements specified in Appendix C.

7.6.5 Class E Software
Class E software shall follow the requirements specified in Appendix D.

7.6.6 Class E1 Software
Class E1 software has no additional software engineering or software assurance requirements.

Appendix A – ARC Software Classification Report Standard

ARC Software Classification Report

Project Name: _____ **Date** _____

Organization: _____ **Project Manager**: _____

Current Project Status: _____

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Project Description: _____

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NPR 7150.2 Software Class: **A** **B** **C** **D** **E** **E1**

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Is the Software Safety-Critical? **o Yes** **o No**

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Potential for Catastrophic Mission Failure? **o Yes** **o No**

Potential for Partial Mission Failure? **o Yes** **o No**

Potential for waste of resource investment (number of work-years): _____

Potential for impact to equipment, facility, or environment (dollars): _____

Software Assurance Level of Effort: **Full** **High** **Medium** **Low** **Not Applicable**

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Implementation approach:

- o **In-house software development**
- o **Acquisition of software from another organization or company**
- o **Integration of acquired software**

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Comments: _____

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EPG Concurrence (Date): _____

Appendix B – Procedure for Class C Software

Objective	Describe the process for developing, maintaining, or operating Class C software by or for NASA ARC. This procedure satisfies the project requirements for Class C software in the compliance matrix in NASA Software Engineering Requirements, NPR 7150.2.
NASA Policy Requirements	The software management process requires the understanding and application of other NASA policy requirements that impact the development, release, and/or maintenance of software. Specifically, these policy requirements relate to: • Software disclosure: NPD2091.1, Inventions Made by Government Employees, Section 305 of the Space Act (42 USC 2457), and 35 USC 200 et seq. (including Section 202(c)) • Export control: NPR 2190.1, NASA Export Control Program • External release: NPR 2210.1, External Release of NASA Software • Security: NPD 2810.1, NASA Information Security Policy • Disabilities: NPR 3713.1, Procedures for Providing Reasonable Accommodations for Individuals with Disabilities; and Section 508 of the Rehabilitation Act (29 USC 749d), http://www.access-board.gov/sec508/508standards.htm.
Software Assurance	This procedure satisfies the software assurance requirements for Class C software (software assurance level of effort/priority of medium/medium) of NASA-STD-8739.8, NASA Software Assurance Standard.
Safety Critical Software	When a project is determined to have safety critical software, the project shall ensure that the safety requirements of NASA-STD-8719.13, Software Safety Standard, are implemented by the project.
SEI Require-ments	The project shall ensure that software is developed by an organization that has a CMMI®-SE/SW Capability Level 2 or higher (or equivalent) as measured by a Software Engineering Institute (SEI) authorized lead appraiser from an external organization in the following Process Areas: a. Requirements Management b. Project Planning c. Project Monitoring and Control d. Supplier Agreement Management e. Measurement and Analysis f. Process and Product Quality Assurance g. Configuration Management In lieu of a supplier CMMI certification, the project will conduct a software capability evaluation in the above process areas, and mitigate any risks, if deficient.
Procedures in this Document	The following procedures are in this document: • Project Planning Procedure • Project Management Procedure • Software Engineering Procedure • Acquisition Planning Procedure • Acquisition Management Procedure • Software Assurance Procedure • Operations, Maintenance, and Retirement Procedure

Step	Project Planning Procedure
1	**The project shall assess options using criteria to address risk, cost, and benefits for each option listed below:** • Acquire an off-the-shelf software product that satisfies the requirement. • Develop the software product or obtain the software service internally. • Develop the software product or obtain the software service through contract. • Enhance an existing software product or service. • Any combination of the four options above.
2	**The project shall develop project plan(s) according to the ARC Software Project Plan Standard.** • The project shall establish and document at least one software cost estimate that satisfies the following conditions: a. It covers the entire software life cycle. b. It is based on selected project attributes (e.g., assessment of the size, functionality, complexity, criticality, and/or risk of the software processes and products). c. It is based on an assessment of the technology to be used and the impact on risk, cost, and schedule. • The project shall document a software schedule that satisfies the following conditions: a. It coordinates with the overall project schedule. b. It documents the relationships of milestones and deliverables among software, hardware, operations, and the rest of the system. • The project shall plan project specific software training for project personnel, including software assurance. • The project shall select and document a software development life cycle or model that includes phase transition criteria for each life cycle phase (e.g., formal review milestones, informal reviews, SRR, PDR, CDR, TRR, customer acceptance or approval reviews). • The project shall determine which software processes, activities, and tasks are appropriate for the project, including the expectations for the software supplier. • The project shall document the software acquisition planning decisions (e.g., in their project plan). • The project shall select and document specific measures to achieve the project objectives. GUIDANCE: Recommend that the project select and record the selection of specific measures (or a subset) in the following areas: software progress tracking, software functionality, software quality, software requirements volatility, software characteristics.
3	**The project shall develop verification and validation plan(s) according to the ARC Software Verification and Validation Plan Standard.** • The project shall plan software verification and validation activities, methods, environments, and criteria for the project, including peer reviews and inspections. • The project shall include testing (e.g., test planning, unit testing) in the verification and validation plan; in other words, the project shall document the planned tests to verify and validate the product(s). • The project shall document the acceptance criteria and conditions for the software in the verification and validation plan. GUIDANCE: – The verification and validation plan may be combined with the project plan. – Safety and mission-success related design and code components should be peer reviewed. – Recommend that the project peer reviews Software Test Plans. – Each peer review should use a checklist to evaluate work products, and should use pre-established readiness and completion criteria.

Step	Project Planning Procedure
4	**The project shall develop configuration management plan(s) according to the Configuration Management Plan template in APR 8040.1A.** • The project shall describe the functions, responsibilities, and authority for the project software configuration management implementation in the configuration management plan. • The project shall identify the software configuration items (e.g., software documents, code, data, scripts) and the versions to be controlled by the project. • The project shall define the baselining and change control procedures to be used in the configuration management plan. GUIDANCE: The configuration management plan may be combined with the project plan.
5	**The project shall develop software assurance plan(s) according to the template in Appendix B of the NASA Software Assurance Standard.**

Step	Project Management Procedure
1	**The project shall implement and execute the software plan(s), and ensure that actual results and performance are tracked against the software plan(s).** • The project shall maintain the software cost estimate. • The project shall maintain the software schedule. • The project shall track and ensure project specific software training for project personnel, including software assurance. • The project shall update the plan, schedule, and cost estimate as the project changes. GUIDANCE: Projects can use emails or project status reports to document project results.
2	**The project shall regularly hold reviews of software activities, status, and results with the project stakeholders, and shall track action items and issues to resolution.** GUIDANCE: Projects can use meeting minutes to document project meetings and reviews.
3	**The project shall ensure that corrective actions are taken and managed to closure when actual results and performance deviate from the software plans.**
4	**The project shall ensure that changes to commitments (e.g., software plans) are agreed to by the affected groups and individuals.** • In the event a system or subsystem evolves to a different software classification or software assurance level, the project shall replan to meet the procedural requirements of the new situation.
5	**The project shall track and evaluate changes to software products according to APR 8040.1A Section 7.3.** • The project shall prepare and maintain records of the configuration status of configuration items, including content definition of all releases. GUIDANCE: The project can use a software change request or software problem tracking system.
6	**The project shall specify and record data collection and storage procedures for their selected software measures, and shall collect and store the measures.** • The project shall analyze software measurement data and document the results. • The project shall report measurement analysis results periodically in the ARC Software Metrics Report, and submit copies to the AEPG. • The project shall include software quality measures in the measurement analysis. GUIDANCE: Data should be maintained in the NASA process asset library.

Step	Software Engineering Procedure
1	**The project shall identify, develop, document, approve, and maintain software requirements based on analysis of customer and other stakeholder requirements and the operational concepts.** • The project shall document the project's software requirements according to the ARC Software Requirement Specification Standard. • If the project is not the supplier, then the project shall require the supplier to document the supplier's software requirements according to the ARC Software Requirement Specification Standard. • The project shall ensure that both project's and supplier's software requirements analysis are performed, based on flowed-down and derived requirements from the top-level systems engineering requirements and the hardware specifications and design. • The project shall ensure that changes to both project's and supplier's software requirements are collected and managed, and that any identified inconsistencies are resolved. • The project shall ensure that peer reviews are performed on the project's and supplier's Software Requirements Specifications. The project shall ensure that peer reviews are performed on any other work products identified in either the project's and supplier's verification and validation plans and project plans.. • The project shall ensure that any issues identified in the peer reviews are tracked until resolved. • The project shall ensure that requirements validation is performed to ensure that the software will perform as intended in the customer environment (customer needs and expectations are met). • The project shall ensure that the requirements are kept up to date as the requirements are changed (e.g., using a change request). • The project shall ensure that requirements changes are analyzed for impact to the quality of the product, and that appropriate actions are taken to maintain quality. GUIDANCE: – The project should analyze and document changes to requirements for cost, technical, and schedule impacts. – The requirements analysis includes safety criticality, correctness, consistency, clarity, completeness, traceability, feasibility, verifiability, and maintainability. This includes the allocation of functional and performance requirements to functions and subfunctions. – Recommended for each peer review: ○ Use a checklist to evaluate the work products. ○ Use established readiness and completion criteria.
2	**The project shall require the supplier to transform the allocated and derived requirements into software architectural and detailed design document(s) according to the ARC Software Design Description Standard.**
3	**The project shall require the supplier to define and document the external and internal interfaces according to the ARC Software Interface Design Description Standard.**
4	**The project shall ensure that the supplier implements the software design into software code.**
5	**The project shall ensure that a software version description document for each software release is provided according to the Software Baseline Description template in APR 8040.1A.**
6	**The project shall establish and implement procedures for the storage, handling, delivery, release, and maintenance of deliverable software products according to APR 8040.1A Section 7.6.** GUIDANCE: • Backups of these products have been stored on physically different media. • Record the following information in the project log or plan: – The storage location of the products, results, corresponding software test inputs and test outputs – How access to these products is controlled – Backup/restoration contact and retention period

Step	Software Engineering Procedure
7	**The project shall complete and deliver the software product to the customer with appropriate documentation to support the operations and maintenance phase of the software life cycle.** GUIDANCE: Delivery includes, as applicable, Software User's Manual, source files, executable software, procedures for creating executable software, procedures for modifying the software, and software version description. Open source software licenses should be reviewed by the Center Chief of Patent/Intellectual Property Counsel before being accepted into software development projects.

Step	Acquisition Planning Procedure
1	**The project shall ensure that when COTS, GOTS, MOTS, open source, reuse, legacy, or heritage software product is to be acquired, the following conditions are satisfied:** • The requirements that are to be met by the off-the-shelf software are identified. • The off-the-shelf software includes documentation to fulfill its intended purpose (e.g. usage instructions). • Proprietary, usage, ownership, warranty, licensing rights, and transfer are addressed. • Future support for the off-the-shelf software product is planned. • Off-the-shelf software is validated to the same level of confidence as would be required of the developed software. GUIDANCE: It is the responsibility of the organization proposing to procure off-the-shelf software to document, prior to procurement, the plan for validating that such software can be assigned the same level of confidence that would be needed for an equivalent class of software if obtained through a "development" process. For critical systems or systems which must be maintained for long periods of time beyond the time a supplier would maintain or support the software, the following should be considered: a. Supplier agreement to deliver or escrow source code or third party maintenance agreement is in place. b. A risk mitigation plan to cover the following cases is available: (1) Loss of supplier or third party support for the product. (2) Loss of maintenance for the product (or product version). (3) Loss of the product (e.g., license revoked, recall of product, etc.) c. Agreement that the project has access to defects discovered by the community of users has been obtained. When available, the project can join a product users group to obtain this information. d. The plan to provide adequate support is in place, including timely maintenance and cost of maintenance. e. Any changes to the software management, development, operations, or maintenance plans that are affected by the use or incorporation of COTS, GOTS, MOTS, reuse, legacy, or heritage software should be documented by the project.
2	**The project shall ensure that software is developed by an organization that has a CMMI®-SE/SW Capability Level 2 or higher (or equivalent) in the process areas listed in the SEI Requirements Section. Otherwise, the project shall conduct a software capability evaluation of the supplier(s), and mitigate risks caused by the deficiencies.**

Step	Acquisition Planning Procedure
3*	**The project shall establish a procedure for software supplier selection, including proposal evaluation criteria.** • The project shall require the software supplier to develop project plan(s) according to the ARC Software Project Plan Standard. • The project shall require the software supplier to provide and maintain at least one software cost estimate that satisfies the following conditions: a. It covers the entire software life cycle. b. It is based on selected project attributes (e.g. assessment of the size, functionality, complexity, criticality, and/or risk of the software processes and products). c. It is based on the assessment of the technology to be used and the impact on risk, cost, and schedule. • The project shall require the software supplier to develop verification and validation plan(s) according to the ARC Software Verification and Validation Plan Standard. • The project shall ensure that the software supplier plans software verification and validation activities, methods, environments, and criteria; including peer reviews, inspections, and testing. • The project shall require the software supplier to develop configuration management plan(s) according to the **Configuration Management Plan template in APR 8040.1A**. • The project shall ensure that the software supplier identifies the software configuration items (e.g. software documents, code, data, scripts) and versions to be controlled by the supplier. • The project shall require the software supplier to develop software assurance plan(s) according to IEEE STD 730-2002, IEEE Standard for Software Quality Assurance Plans. • The project shall review the supplier software plan(s), and reconcile those with the plans from the Project Planning Procedure. • The project shall perform an updated software classification and software assurance level assessment using the accepted proposal information. The project shall apply the updated software assessment results to update the project's and supplier's software procedural requirements.
4*	**The project shall define and document the supplier's acceptance criteria and conditions for the software that would be consistent with the project's acceptance criteria and the project's software requirements.**
5*	**The project shall define the milestones at which the software supplier(s) progress will be reviewed and audited as a part of the monitoring of the acquisition.** • The project shall require notification from the software supplier(s) if open source software will be included in software developed for the project. GUIDANCE: All known contract milestones are expected to be included in the resulting contract.
6*	**The project shall require the software supplier(s) to provide software schedule(s) for the project's review, and provide updates as requested.** • The project shall ensure that the supplier's software schedule satisfies the following conditions: a. It coordinates with the overall project schedule. b. It documents the interactions of milestones and deliverables between software, hardware, operations, and the rest of the system.
7*	**The project shall document in the solicitation the software processes, activities, and tasks to be performed by the supplier, including software assurance.** • The project shall define and participate in joint NASA/supplier(s) audits of the software development process, software configuration management process, and software assurance process. GUIDANCE: All known contract requirements should be addressed in the Request for Proposals and included in the resulting contract. Please see the NASA Software Engineering Requirements, NPR 7150.2 for more details.

Step	Acquisition Planning Procedure
8*	**The project shall define to the software supplier(s) how insight into software development and test activities will be accomplished, including monitoring integration and verification adequacy, trade study data, auditing the software development process, and participation in all software reviews and technical interchange meetings.** • The project shall require the software supplier(s) to provide NASA all software products and software process tracking information, in electronic format, including all software development and management metrics. • The project shall require the software supplier(s) to provide NASA with electronic access to the source code developed for the project, including modified off-the-shelf software and non-flight software (ground test software, simulations, ground analysis software, ground control software, science data processing software, hardware manufacturing software, or other). • The project shall require the software supplier(s) to make available, electronically, the software traceability data for the project's review.
9*	**The project shall define to the software supplier(s) what software metric data shall be delivered for the project's Software Metrics Report.**
* The Step is not required to be performed if the project is the supplier, or if the supplier is integrated into the project's plans, processes, activities, and tasks.	

Step	Acquisition Management Procedure
1*	**The project shall ensure that the software supplier(s) implements and executes according to the supplier's software plan(s), and shall ensure that actual results and performance are tracked against the supplier's software plan(s).** • The project shall ensure both the acquirer and supplier software assurance staff perform their specific software assurance activities per their plans and contract. • The project shall ensure that the acquirer software assurance staff performs tasks to provide insight and oversight of the supplier's adherence to approved plans and procedures. • The project shall ensure that software products have proper configuration management. GUIDANCE: If the project is also the supplier, then the above requirements may be the same as those required in the Project Management Procedure and in the Software Engineering Procedure.
2*	**The project shall ensure that the software supplier(s) implements and manages corrective actions to closure when actual results and performance deviate from the supplier's software plans.**
3*	**The project shall ensure that the software supplier(s) prepares and maintains records of the configuration status of their configuration items, including content definition of all their releases.** • The project shall require the software supplier(s) to track all software changes, and to provide the data for the project's review.

Step	Acquisition Management Procedure
4	**The project shall ensure that the software products and code are verified, validated, and tested according to the project's and supplier's verification and validation plans.** • The project shall ensure that the supplier records, addresses, and tracks to closure the results of the verification and validation activities. • The project shall require the supplier to document software test procedure(s) and software test report(s) per the NPR 7150.2 Section 5.2.6, Software Test Procedures, and NPR 7150.2 Section 5.3.2, Software Test Report. • The project shall ensure that the supplier tests the software (e.g., unit testing) and documents the results. • The project shall ensure that the implementation of each software requirement is verified to the requirement. • The project shall ensure that the test results are evaluated and documented. • The project shall ensure that the defects identified during testing are documented and tracked to closure. • The project shall ensure that the verification and validation plan(s) and software test procedure(s) are updated to be consistent with the software requirements. • The project shall require the supplier to provide and maintain traceability from the software test procedures to the software requirements. • The project shall ensure that the software system is validated on the targeted platform or high-fidelity simulation. GUIDANCE: The software should be tested on the target system, and identify its configuration. An acceptance test should be completed at closeout.
5*	**The project shall require the supplier to provide a software version description document for each supplier software release according to the Software Baseline Description template in APR 8040.1A.**
6*	**The project shall require the supplier to establish and implement procedures for the storage, handling, delivery, release, and maintenance of deliverable software products according to APR 8040.1A Section 7.6.**
7*	**The project shall require the supplier to complete and deliver the software product with appropriate documentation to support the operations and maintenance phase of the software life cycle.**
* The Step is not required to be performed if the project is the supplier, or if the supplier is integrated into the project's plans, processes, activities, and tasks.	

Step	Operations, Maintenance, and Retirement Procedure
1	**The project shall plan software operations, maintenance, and retirement activities.**
2	**The project shall require the supplier(s) to develop software maintenance plan(s) according to the ARC Software Maintenance Plan Standard.**
3	**The project shall ensure that the supplier(s) implements software operations, maintenance, and retirement activities as defined in their software maintenance plan(s).** • For software that is to be operated routinely, establish and implement procedures for the activities that will be followed for software operations.

Step	Operations, Maintenance, and Retirement Procedure
4	**The project shall ensure that software products are completed and delivered to the customer with appropriate documentation to support the operations and maintenance phase of the software life cycle.** GUIDANCE: Delivery includes, as applicable, Software User's Manual, source files, executable software, procedures for creating executable software, procedures for modifying the software, and a Software Version Description. Open source software licenses should be reviewed by the Center Chief of Patent/Intellectual Property Counsel before being accepted into software development projects. Other documentation that should be considered for delivery is: a. Summary and status of all accepted change requests to the baselined Software Requirements Specification(s). b. Summary and status of all major software capability changes since baselining of the Software Design Document(s). c. Summary and status of all major software tests (including development, verification, and performance testing). d. Summary and status of all discrepancy reports written against the software. e. Summary and status of all software requirements deviations and waivers. f. Summary and status of all software user notes. g. Summary and status of all quality measures historically and for this software. h. Definition of open work, if any. i. Software configuration records defining the verified and validated software, including requirements verification data (e.g., requirements verification matrix). j. Final version of the software documentation, including the final Software Version Description document(s). k. Summary and status of any open software-related risks.

Step	Software Assurance Procedure
1	**The project shall designate a software assurance manager who has responsibility and authority for carrying out the project's software assurance activities.**
2	**The software assurance manager shall verify that all project and supplier plans are documented and conform to the requirements specified in this procedure.**
3	**The software assurance manager shall conduct periodic audits at least semi-annually to verify that the provisions of the project and supplier plans are being followed.** • The software assurance manager shall audit that the project plan(s) are being followed: project plan; verification and validation plan; configuration management plan; assurance plan; maintenance plan. • The software assurance manager shall audit that the provisions of this APR are being followed. • The software assurance manager shall audit that applicable standards identified in the project plans are being followed. • The software assurance manager shall audit that the defined life cycle and the associated processes and procedures are being followed. • The software assurance manager shall provide audit reports identifying any areas of non-compliance, problems, and risks to the project manager. • The project manager shall initiate action to resolve non-compliance items. • The software assurance manager shall monitor to closure the resolution of the non-compliance items.
4	**The software assurance manager shall perform a Functional Configuration Audit and a Physical Configuration Audit at the completion of the software development activities, but prior to software delivery or customer use.** • The software assurance manager shall audit configuration management records to verify that changes to requirements are reviewed for impact to the quality of the product and that appropriate actions have been taken as needed to maintain quality levels.

Step	Software Assurance Procedure
5	**The software assurance manager shall audit the project and supplier to verify that software quality metrics are being tracked.**
6	**The software assurance manager shall review test plans to ensure adequacy of testing.** • The software assurance manager shall review test reports to ensure that all planned tests were run and that the test results are evaluated by project management. • The software assurance manager shall review defect reports from the testing on an on-going basis to ensure that they are resolved.
7	**If the software is identified as safety critical in the project plan(s), the software assurance manager shall audit the project and supplier for compliance to the NASA Software Safety Standard (NASA-STD-8719.13).**
8	**The software assurance manager shall prepare periodic software assurance status reports. These reports shall be provided to project management, Safety and Mission Assurance management, and senior management.**

Appendix C – Procedure for Class D Software

Objective	Describe the process for developing, maintaining, or operating Class D software by or for NASA ARC. This procedure satisfies the project requirements for Class D software in the compliance matrix of the NASA Software Engineering Requirements, NPR 7150.2.
NASA Policy Requirements	The software management process requires the understanding and application of other NASA policy requirements that impact the development, release, and/or maintenance of software. Specifically, these policy requirements relate to: • Software disclosure: NPD2091.1, Inventions Made by Government Employees, Section 305 of the Space Act (42 USC 2457), and 35 USC 200 et seq. (including Section 202(c)) • Export control: NPR 2190.1, NASA Export Control Program • External release: NPR 2210.1, External Release of NASA Software • Security: NPD 2810.1, NASA Information Security Policy • Disabilities: NPR 3713.1, Procedures for Providing Reasonable Accommodations for Individuals with Disabilities; and Section 508 of the Rehabilitation Act (29 USC 749d), http://www.access-board.gov/sec508/508standards.htm.
Safety Critical Software	When a project is determined to have safety critical software, the project shall ensure that the safety requirements of NASA-STD-8719.13, Software Safety Standard, are implemented by the project.
Procedures in this Document	The following procedures are in this document: • Project Planning Procedure • Project Management Procedure • Software Engineering Procedure • Acquisition Planning Procedure • Acquisition Management Procedure

Step	Project Planning Procedure
1	**The project shall assess options using criteria to address risk, cost, and benefits for each option listed below:** • Acquire an off-the-shelf software product that satisfies the requirement. • Develop the software product or obtain the software service internally. • Develop the software product or obtain the software service through contract. • Enhance an existing software product or service. • Any combination of the four options above.
2	**The project shall develop project plan(s) according to the ARC Software Project Plan Standard.** • The project shall document the software cost estimate in the project plan which establishes confidence of meeting the project's objectives. • The project shall document the software schedule and software life cycle phases in the project plan. • The project shall determine which software processes, activities, and tasks are appropriate for the project, including the expectations for the software supplier. • The project shall document the software acquisition planning decisions (e.g., in their project plan). • The project shall select and document specific measures to achieve the project objectives.

3	**The project shall develop verification and validation plan(s) according to the ARC Software Verification and Validation Plan Standard.** • The project shall include testing (e.g., test planning, unit testing) in the verification and validation plan; in other words, the project shall document the planned tests to verify and validate the product(s). • The project shall document the acceptance criteria and conditions for the software in the verification and validation plan. GUIDANCE: The verification and validation plan may be combined with the project plan.
4	**The project shall develop configuration management plan(s) according to the Configuration Management Plan template in APR 8040.1A.** • The project shall describe the functions, responsibilities, and authority for the implementation of configuration management in the configuration management plan. • The project shall identify the software configuration items (e.g., software documents, code, data, scripts) and their versions to be controlled by the project. GUIDANCE: The configuration management plan may be combined with the project plan.

Step	Project Management Procedure
1	**The project shall implement and execute the software plan(s), and ensure that actual results and performance are tracked against the software plan(s).** • The project shall update the plan, schedule, and cost estimate as the project changes. GUIDANCE: Projects can use emails or project status reports to document project results.
2	**The project shall regularly hold reviews of software activities, status, and results with the project stakeholders, and shall trackaction items and issues to resolution.** GUIDANCE: Projects can use meeting minutes to document project meetings and reviews.
3	**The project shall ensure that changes to commitments (e.g., software plans) are agreed to by the affected groups and individuals.** • The project shall keep the requirements up to date as requirements change. • In the event a system or subsystem evolves to a different software classification or software assurance level, the project shall replan to meet the procedural requirements of the new situation
4	**The project shall track and evaluate changes to software products according to APR 8040.1A Section 7.3.** GUIDANCE: The project can use a software change request or software problem tracking system.

Step	Software Engineering Procedure
1	**The project shall identify, develop, document, approve, and maintain software requirements based on analysis of customer and other stakeholder requirements and operational concepts.** • The project shall document the project's software requirements according to the ARC Software Requirement Specification Standard. • If the project is not the supplier, then the project shall require the supplier to document the supplier's software requirements according to the ARC Software Requirement Specification Standard. • The project shall ensure that changes to both project's and supplier's software requirements are collected and managed, and that any identified inconsistencies are resolved. • The project shall ensure that the requirements are kept up to date as the requirements are changed (e.g., using a change request). GUIDANCE: The project should analyze and document changes to requirements for cost, technical, and schedule impacts.

Step	Software Engineering Procedure
2	**The project shall require the supplier to transform the allocated and derived requirements into software architectural and detailed design document(s) according to the ARC Software Design Description Standard.**
3	**The project shall require the supplier to define and document the external and internal interfaces according to the ARC Software Interface Design Description Standard.**
4	**The project shall ensure that the supplier implements the software design into software code.**
5	**The project shall ensure that a software version description document for each software release is provided according to the Software Baseline Description template in APR 8040.1A.**
6	**The project shall establish and implement procedures for the storage, handling, delivery, release, and maintenance of deliverable software products according to APR 8040.1A Section 7.6.** GUIDANCE: • Backups of these products have been stored on physically different media. • Record the following information in the project log or plan: – The storage location of the products, results, corresponding software test inputs and test outputs – How access to these products is controlled – Backup/restoration contact and retention period
7	**The project shall complete and deliver the software product to the customer with appropriate documentation to support the operations and maintenance phase of the software life cycle.** GUIDANCE: Delivery includes, as applicable, Software User's Manual, source files, executable software, procedures for creating executable software, procedures for modifying the software, and software version description. Open source software licenses should be reviewed by the Center Chief of Patent/Intellectual Property Counsel before being accepted into software development projects.

Step	Acquisition Planning Procedure
1*	**The project shall establish a procedure for software supplier selection, including proposal evaluation criteria.** • The project shall require the software supplier to develop project plan(s) according to the ARC Software Project Plan Standard. • The project shall ensure that software supplier's software cost estimate in the project plan establishes confidence of meeting the project's objectives. • The project shall require the software supplier to develop verification and validation plan(s) according to the ARC Software Verification and Validation Plan Standard. • The project shall ensure that testing (i.e., test planning, unit testing) is included in the verification and validation plan • The project shall require the software supplier to develop configuration management plan(s) according to the **Configuration Management Plan template in APR 8040.1A**. • The project shall ensure that the software supplier identifies the software configuration items (e.g. software documents, code, data, scripts) and versions to be controlled by the supplier. • The project shall review the supplier software plan(s), and reconcile those with the plans from the Project Planning Procedure.
2*	**The project shall define and document the supplier's acceptance criteria and conditions for the software that would be consistent with the project's acceptance criteria and the project's software requirements.**

3*	**The project shall define the milestones at which the software supplier(s) progress will be reviewed and audited as a part of the monitoring of the acquisition.** GUIDANCE: All known contract milestones are expected to be included in the resulting contract.
4*	**The project shall require the software supplier(s) to provide software schedule(s) for the project's review, and provide updates as requested.**
5*	**The project shall document in the solicitation the software processes, activities, and tasks to be performed by the supplier.**
6*	**The project shall define to the software supplier(s) how insight into software development and test activities will be accomplished, including monitoring integration and verification adequacy, trade study data, auditing the software development process, and participation in all software reviews and technical interchange meetings.**
7*	**The project shall define to the software supplier(s) what software metric data shall be delivered.**
* The Step is not required to be performed if the project is the supplier, or if the supplier is integrated into the project's plans, processes, activities, and tasks.	

Step	Acquisition Management Procedure
1*	**The project shall ensure that the software supplier(s) implements and executes according to the supplier's software plan(s), and shall ensure the actual results and performance are tracked against the supplier's software plan(s).** GUIDANCE: If the project is also the supplier, then the above requirements may be the same as those required in the Project Management Procedure and in the Software Engineering Procedure.
2	**The project shall ensure that the software products and code are verified, validated, and tested according to the project's and supplier's verification and validation plans.** • The project shall ensure that the supplier records, addresses, and tracks to closure the results of verification and validation activities. • The project shall require the supplier to document software test procedure(s) and software test report(s). • The project shall ensure that the supplier tests the software (e.g., unit testing) and documents the results. • The project shall ensure that the implementation of each software requirement is verified to the requirement. • The project shall ensure that the test results are evaluated and documented. • The project shall ensure that the defects identified during testing are documented and tracked to closure. • The project shall provide and maintain traceability from the software test procedures to the software requirements. GUIDANCE: The software should be tested on the target system, and identify its configuration. An acceptance test should be completed at closeout.
3*	**The project shall require the supplier to provide a software version description document for each software release according to the Software Baseline Description template in APR 8040.1A.**
4*	**The project shall require the supplier to establish and implement procedures for the storage, handling, delivery, release, and maintenance of deliverable software products according to APR 8040.1A Section 7.6.**
5*	**The project shall require the supplier to complete and deliver the software product with appropriate documentation to support the operations and maintenance phase of the software life cycle.**
* The Step is not required to be performed if the project is the supplier, or if the supplier is integrated into the project's plans, processes, activities, and tasks.	

Appendix D – Procedure for Class E Software

Objective	Describe the process for developing, maintaining, or operating Class E software by or for NASA ARC. This procedure satisfies the project requirements for Class E software in the compliance matrix of the NASA Software Engineering Requirements, NPR 7150.2.
NASA Policy Requirements	The software management process requires the understanding and application of other NASA policy requirements that impact the development, release, and/or maintenance of the software. Specifically, these policy requirements relate to: • Software disclosure: NPD2091.1, Inventions Made by Government Employees; Section 305 of the Space Act (42 USC 2457); and 35 USC 200 et seq. (including Section 202(c)) • Export control: NPR 2190.1, NASA Export Control Program • External release: NPR 2210.1, External Release of NASA Software • Security: NPD 2810.1, NASA Information Security Policy • Disabilities: NPR 3713.1, Procedures for Providing Reasonable Accommodations for Individuals with Disabilities; and Section 508 of the Rehabilitation Act (29 USC 749d), http://www.access-board.gov/sec508/508standards.htm
Safety Critical Software	When a project is determined to have safety critical software, the project shall ensure that the safety requirements of NASA-STD-8719.13, Software Safety, are implemented by the project.

STEP	ACTIONS TO BE TAKEN
1	**The project shall record the following project information in a project log or plan:** • Project title • Software class (i.e., Class E) • Cost estimate of the project • Software completion date • The software requirements (e.g., capabilities, outputs, and any constraints on the software) • The planned tests used to verify and validate the product(s)
2	**The project shall develop the software products by following the project log or plan:** • Update the plan and cost estimate as the project changes • Keep the requirements up to date as requirements change • In the event a system or subsystem evolves to a different software classification, the project shall replan to meet the procedural requirements of the new classification
3	**The project shall test the software (e.g., unit testing) and document the results.** GUIDANCE: Test results may be documented in the project log.
4	**The project shall establish and implement procedures for the storage, handling, delivery, release, and maintenance of deliverable software products.** GUIDANCE: • Backups of these products have been stored on physically different media. • Record the following information in the project log or plan: – The storage location of the products, results, corresponding software test inputs and test outputs – How access to these products is controlled – Backup/restoration contact and retention period
5	**The project shall complete and deliver the software product to the customer with appropriate documentation to support the operations and maintenance phase of the software life cycle.**

Appendix E – Mapping of ARC Class C, D, and E Procedures to NPR 7150.2

Section of NPR	Requirement Descriptor*	SWE Require-ment #	Respon-sibility	ARC Software Procedure Class C	ARC Software Procedure Class D	ARC Software Procedure Class E
Compliance with Laws, Policies & Requirements	*SW Disclosures*	7	Project	Note 1 NASA PR	Note 1 NASA PR	Note 1 NASA PR
	Export Control	8	Project	Note 1 NASA PR	Note 1 NASA PR	Note 1 NASA PR
	External Release	9	Project	Note 1 NASA PR	Note 1 NASA PR	Note 1 NASA PR
	Security	10	Project	Note 1 NASA PR	Note 1 NASA PR	Note 1 NASA PR
	Disabilities	11	Project	Note 1 NASA PR	Note 1 NASA PR	Note 1 NASA PR
	Disabilities	12	Project	Note 1 NASA PR	Note 1 NASA PR	Note 1 NASA PR
SW Life Cycle Planning	*SW Plan*	13	Project	X PPP Step 2 PPP Step 3 PPP Step 4 PPP Step 5 APP Step 3 OMR Step 2	P (Center) PPP Step 2 PPP Step 3 PPP Step 4 APP Step 1	P (Center) Step 1
	Execute Plan	14	Project	X PMP Step 1 AMP Step 1 AMP Step 4	X PMP Step 1 AMP Step 1 AMP Step 2	P (Center) Step 2
	Cost Estimation	15	Project	X PPP Step 2 PMP Step 1 APP Step 3	P (Center) PPP Step 2 APP Step 1	P (Center) Step 1
	Schedule	16	Project	X PPP Step 2 PMP Step 1 APP Step 6	P (Center) PPP Step 2	Step 1
	Training	17	Project	X PPP Step 2 PMP Step 1		
	Reviews	18	Project	X PMP Step 2	X PMP Step 2	
	Life Cycle	19	Project	X PPP Step 2	P (Center) PPP Step 2	

Section of NPR	Requirement Descriptor*	SWE Require-ment #	Respon-sibility	ARC Software Procedure Class C	ARC Software Procedure Class D	ARC Software Procedure Class E
	SW Classification	20	Project	X Sw APR Para 5.1 Sw PPS	X Sw APR Para 5.1 Sw PPS	X Sw APR Para 5.1 Step 1
	SW Classification changes	21	Project	X PMP Step 4 APP Step 3	X PMP Step 3	X Step 2
	SW Assurance	22	Project	P (project) Sw APR Para 4.9 SA SAP	Sw APR Para 4.9	Sw APR Para 4.9
	SW Safety	23	Project	X SCS SAP Step 7	X SCS	X SCS
	Plan Tracking	24	Project	X PMP Step 1 AMP Step 1	P (Center) PMP Step 1 AMP Step 1	
	Corrective Action	25	Project	X PMP Step 3 AMP Step 2		
	Changes	26	Project	X PMP Step 4	PMP Step 3	
Off The Shelf (OTS) SW	*COTS, GOTS, MOTS*	27	Project	X APP Step 1		
Verification & Validation	*Verification planning*	28	Project	X PPP Step 3 APP Step 3	P (Center) PPP Step 3 APP Step 1	Step 1
	Validation planning	29	Project	X PPP Step 3 APP Step 3	P (Center) PPP Step 3 APP Step 1	Step 1
	Verification results	30	Project	X AMP Step 4	X AMP Step 2	
	Validation results	31	Project	X AMP Step 4	X AMP Step 2	
Project Formulation	*CMM L3 or CMMI L2*	32	Project	P (Center) SR APP Step 2		
	Options for Acquisition	33	Project	X PPP Step 1	X PPP Step 1	
	Acceptance Criteria	34	Project	X PPP Step 3 APP Step 4	P (Center) PPP Step 3 APP Step 2	Step 1
	Supplier Selection	35	Project	X APP Step 3	APP Step 1	

Section of NPR	Requirement Descriptor*	SWE Require-ment #	Respon-sibility	ARC Software Procedure Class C	ARC Software Procedure Class D	ARC Software Procedure Class E
	SW processes & tasks	36	Project	X Sw APR PPP Step 2	P (Center) Sw APR PPP Step 2	
	Milestone	37	Project	X APP Step 5	P (Center) APP Step 3	
	Acquisition planning	38	Project	X PPP Step 2	P (Center) PPP Step 2	
Government Insight	*Insight into test*	39	Project	P (Center) APP Step 8	P (Center) APP Step 6	
	Electronic access	40	Project	P (Center) APP Step 8		
	Open source	41	Project	P (Center) APP Step 5		
	Source code access	42	Project	P (Center) APP Step 8		
Supplier Monitoring	*Track change request*	43	Project	P (Center) AMP Step 3		
	SW measurement data	44	Project	X APP Step 9	P (Center) APP Step 7	
	Joint audits	45	Project	X APP Step 7		
	SW schedule	46	Project	X APP Step 6	X APP Step 4	
	Traceability data	47	Project	P (Center) APP Step 8		
	Solicitation	48	Project	X PPP Step 2 APP Step 7	P (Center) PPP Step 2 APP Step 5	
SW Requirements Development	*Document*	49	Project	X SEP Step 1	X SEP Step 1	P (Center) Step 1
	SW requirements	50	Project	X SEP Step 1	X SEP Step 1	
	Flow-down & derived req.	51	Project	X SEP Step 1		
SW Requirements Management	*Manage req. change*	53	Project	X PMP Step 5 SEP Step 1	X PMP Step 4 SEP Step 1	P (Center) Step 2
	Corrective action	54	Project	PMP Step 3 SEP Step 1 APP Step 3 AMP Step 2	SEP Step 1 APP Step 1	
	Requirements Validation	55	Project	X SEP Step 1		

Section of NPR	Requirement Descriptor*	SWE Require-ment #	Respon-sibility	ARC Software Procedure Class C	ARC Software Procedure Class D	ARC Software Procedure Class E
SW Design	*Document design*	56	Project	P (Center) SEP Step 2 SEP Step 3	SEP Step 2 SEP Step 3	
	Architecture	57	Project	P (Center) SEP Step 2 SEP Step 3	P (Center) SEP Step 2 SEP Step 3	
	Detailed design	58	Project	SEP Step 2 SEP Step 3	SEP Step 2 SEP Step 3	
SW Implemen-tation	*Design --> code*	60	Project	X SEP Step 4	X SEP Step 4	
	Unit test	62	Project	X AMP Step 4	P (Center) AMP Step 2	P (Center) Step 3
	Version Description	63	Project	P (Center) SEP Step 5 AMP Step 5	X SEP Step 5 AMP Step 3	
SW Testing	*Plan, procedures, reports*	65	Project	X PPP Step 3 APP Step 3 AMP Step 4	P (Center) PPP Step 3 APP Step 1 AMP Step 2	Step 1
	Perform testing	66	Project	X AMP Step 4	X AMP Step 2	Step 3
	Test for compliance	67	Project	X AMP Step 4	AMP Step 2	
	Evaluate test results	68	Project	X AMP Step 4	X AMP Step 2	
	Doc. defect & track	69	Project	X AMP Step 4	P (Center) AMP Step 2	
	Update plans & procedures	71	Project	X AMP Step 4		
	Maintain Traceability	72	Project	X AMP Step 4	X AMP Step 2	
	Platform or Hi-Fidelity sim.	73	Project	X AMP Step 4		
SW Operations, Maintenance, and Retirement	*Document maint. plans*	74	Project	X OMR Step 2		
	Plan ops, maint. & retirement	75	Project	X OMR Step 1		
	Implement plans	76	Project	X OMR Step 3		
	Deliver software product	77	Project	X SEP Step 7 AMP Step 7 OMR Step 4	X SEP Step 7 AMP Step 5	P (Center) Step 5

Section of NPR	Requirement Descriptor*	SWE Require-ment #	Respon-sibility	ARC Software Procedure Class C	ARC Software Procedure Class D	ARC Software Procedure Class E
SW Configuration Management	*Develop CM plan*	79	Project	X PPP Step 4 APP Step 3	X PPP Step 4 APP Step 1	
	Track & evaluate changes	80	Project	X PMP Step 5 SEP Step 1	P (Center) PMP Step 4 SEP Step 1	
	Identify sw configuration items	81	Project	X PPP Step 4 APP Step 3	P (Center) PPP Step 4	
	Authorizing Changes	82	Project	PPP Step 4		
	Maintain records	83	Project	X PMP Step 5 AMP Step 3		
	Implement procedures	85	Project	X SEP Step 6 AMP Step 6	P (Center) SEP Step 6 AMP Step 4	P (Center) Step 4
Peer Reviews	*Requirements & Test Plans*	87	Project	P (Center) SEP Step 1		
	Checklist, criteria, & tracking	88	Project	P (Center) SEP Step 1		
SW Measurement	*Objectives*	90	Project	X PPP Step 2	PPP Step 2	
	SW measurement areas	91	Project	P (Center) PPP Step 2	PPP Step 2	
	Collection & storage	92	Project	X PMP Step 6		
	Analyze data	93	Project	P (Center) PMP Step 6		
	Report analysis	94	Project	P (Center) PMP Step 6		
SW Document-ation Requirements	*SW Development/Mgt. Plan*	102	Project	P (Center) PPP Step 2 PPP Step 3 APP Step 3 Sw PPS Sw VVPS	P (Center) PPP Step 2 PPP Step 3 APP Step 1 Sw PPS Sw VVPS	Step 1
	SW Configuration Mgt. Plan	103	Project	P (Center) PPP Step 4 APP Step 3 APR 8040.1A	P (Center) PPP Step 4 APP Step 1 APR 8040.1A	
	SW Test Plan	104	Project	P (Center) PPP Step 3 APP Step 3 Sw VVPS	P (Center) PPP Step 3 APP Step 1 Sw VVPS	Step 1

Section of NPR	Requirement Descriptor*	SWE Require-ment #	Respon-sibility	ARC Software Procedure Class C	ARC Software Procedure Class D	ARC Software Procedure Class E
	SW Maintenance Plan	105	Project	OMR Step 2 Sw MPS		
	SW Assurance Plan	106	Project	PPP Step 5 APP Step 3		
	SW Requirements Spec.	109	Project	P (Center) SEP Step 1 Sw RSS	P (Center) SEP Step 1 AMP Step 2 Sw RSS	Step 1
	SW Design Description	111	Project	P (Center) SEP Step 2 Sw DDS	P (Center) SEP Step 2 Sw DDS	
	Interface Design Description	112	Project	P (Center) SEP Step 3 Sw IDDS	SEP Step 3 Sw IDDS	
	SW Change Request/ Problem Report	113	Project	P (Center) PMP Step 5 SEP Step 1	PMP Step 4 SEP Step 1	
	SW Test Procedures	114	Project	P (Center) AMP Step 4	AMP Step 2	
	SW Version Description	116	Project	P (Center) SEP Step 5 AMP Step 5 APR 8040.1A	P (Center) SEP Step 5 AMP Step 3 APR 8040.1A	
	SW Metrics Report	117	Project	P (Center) PMP Step 6 Sw MRS		
	SW Test Report	118	Project	P (Center) AMP Step 4	AMP Step 2	Step 3
Compliance	*Compliance Matrix*	125	Project	X Sw APR Mapping Matrix Appendix	X Sw APR Mapping Matrix Appendix	X Sw APR Mapping Matrix Appendix

* See Requirement in NPR for full description

Light Grey shaded box indicates that the requirement cannot be waived by the project via the ITA (see Chapter 6)

X - Project is required to meet the requirement as written

X (not OTS) - Project is required to meet except for off-the-shelf software

P (Center) - Per Center defined process

P (project) - As defined in the project or software development plan

Blank Space - Project is not required to meet the requirement

Section of NPR	Requirement Descriptor*	SWE Require-ment #	Respon-sibility	ARC Software Procedure Class C	ARC Software Procedure Class D	ARC Software Procedure Class E
Note 1 - The scope of this requirement is contained in the source NPD or NPR Note 2 - This requirement can only be waived by the OSMA ITA Note 3 - For Class B software, in lieu of a CMM/CMMI certification by a developer, the project will conduct a software capability evaluation in the seven process areas listed in SWE-032 and mitigate any risk, if deficient. NASA PR - ARC Software Class Procedure, NASA Policy Requirements Section. SA - ARC Software Class Procedure, Software Assurance Section. SCS - ARC Software Class Procedure, Safety Critical Software Section. SR - ARC Software Class Procedure, SEI Requirements Section. PPP - ARC Software Class Procedure, Project Planning Sub-Procedure. PMP - ARC Software Class Procedure, Project Management Sub-Procedure. SEP - ARC Software Class Procedure, Software Engineering Sub-Procedure. APP - ARC Software Class Procedure, Acquisition Planning Sub-Procedure. AMP - ARC Software Class Procedure, Acquisition Management Sub-Procedure. SAP - ARC Software Class Procedure, Software Assurance Sub-Procedure. OMR - ARC Software Class Procedure, Operations, Maintenance, and Retirement Sub-Procedure. Sw APR - ARC Software Procedural Requirements Sw PPS - ARC Software Project Plan Standard Sw VVPS - ARC Software Verification and Validation Plan Standard Sw MPS - ARC Software Maintenance Plan Standard Sw RSS - ARC Software Requirements Specification Standard Sw DDS - ARC Software Design Description Standard Sw IDDS - ARC Software Interface Design Description Standard Sw MRS - ARC Software Metrics Report Standard						

Appendix F – Mapping of ARC Class C Procedure to NASA-STD-8739.8

The ARC Class C Procedure is compliant with the NASA-STD-8739.8 medium/medium software assurance level of effort/priority. The software assurance processes were streamlined and made efficient and effective by including the essence of the software assurance disciplines, providing flexibility in the implementation of software assurance, and keeping the software assurance processes and procedures compact and concise. The focus was on requirements, metrics, verification and validation, and audit compliance to NPR 7150.2 and the ARC Class C Procedure.

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
Scope	1	*No requirements*	N/A					
Applicable Documents	2	*No requirements*	N/A					
Definitions And Acronyms	3	*No requirements*	N/A					
Software Assurance Overview	4	*No requirements*	N/A					
Acquirer Software Assurance	5	*Not a requirement*	N/A					
Initialization, Pre-Award	5.1	*Not a requirement*	N/A					
	5.1.1	Identify software assurance manager	Acquirer Mgmt	X				Class C Procedure (SAP Step 1)
	5.1.2	The software assurance manager shall perform the following tasks:						
	5.1.2.1	Perform Classification Assessment	Acquirer SA Mgr	X				Software Engineering APR Chapter 5

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
	5.1.2.2	Ensure safety critical software projects comply with NASA Software Safety Standard NASA-STD-8719.13B	Acquirer SA Mgr	X				Class C Procedure (SCS) Class C Procedure (SAP Step 7)
	5.1.2.3	Ensure tailoring of software assurance requirements based on software classification	Acquirer SA Mgr	X				Class C Procedure; for medium/medium software assurance level of effort/priority
	5.1.2.4	Assure project agreement with classification	Acquirer SA Mgr	X				Software Engineering APR Chapters 4 and 5 Class C Procedure (SAP Step 2) Class C Procedure (SAP Step 8)
	5.1.2.5	Apply acquirer software assurance requirements	Acquirer SA Mgr	X				Class C Procedure (as a whole) Class C Procedure (SAP Step 2)
	5.1.2.6	Apply provider software assurance requirements	Acquirer SA Mgr	X				Class C Procedure (as a whole) Class C Procedure (APP Step 2) Class C Procedure (APP Step 6) Class C Procedure (SAP Step 2)
	5.1.2.7	Assure contract contains oversight/insight requirements	Acquirer SA Mgr	X				Class C Procedure (APP Overall) Class C Procedure (SAP Step 2)
	5.1.2.8	Prepare preliminary acquirer software assurance plan	Acquirer SA Mgr	X				Class C Procedure (PPP Step 5)
	5.1.2.9	Verify that the RFP/MOU/MOA addresses software quality metrics	Acquirer SA Mgr	X				Class C Procedure (PPP Step 2) Class C Procedure (APP Step 6) Class C Procedure (APP Step 8) Class C Procedure (SAP Step 5)
	5.1.2.10	Identify, analyze, track, and control procurement/development risks	Acquirer SA Mgr	X				Class C Procedure (PMP Overall) Class C Procedure (AMP Step 1) Class C Procedure (AMP Step 2) Class C Procedure (SAP Step 2)
Post RFP, Pre-Award	5.2	*Not a requirement*	N/A					
	5.2.1	The software assurance manager shall perform the following tasks:						

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
	5.2.1.1	Evaluate proposals	Acquirer SA Mgr	X				Class C Procedure (APP Step 2) Class C Procedure (APP Step 6)
	5.2.1.2	Participate in pre-award surveys when such surveys are requested.	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
	5.2.1.3	Participate in contract negotiations	Acquirer SA Mgr	X				Class C Procedure (APP Step 2) Class C Procedure (APP Step 6) Class C Procedure (SAP Step 2)
	5.2.1.4	Perform an updated Software Assurance Classification Assessment	Acquirer SA Mgr	X				Class C Procedure (APP Step 2) Class C Procedure (SAP Step 2)
	5.2.1.5	Update software assurance requirements based on Assessment results	Acquirer SA Mgr	X				Class C Procedure (APP Step 2) Class C Procedure (SAP Step 2)
	5.2.1.6	Maintain Assessment results	Acquirer SA Mgr	X				Software Engineering APR Chapter 5 Class C Procedure (PMP Step 4)
Post-Award, Pre-Development	5.3	*Not a requirement*	N/A					
	5.3.1	The software assurance manager shall perform the following tasks:						
	5.3.1.1	Verify provider's software assurance plan meets contractual requirements.	Acquirer SA Mgr	X				Class C Procedure (APP Step 2) Class C Procedure (APP Step 6)
	5.3.1.2	Verify acquirer's and provider's software assurance plans are consistent, compatible, and baselined	Acquirer SA Mgr	X				Class C Procedure (APP Step 2)
	5.3.1.3	Ensure acquirer software assurance personnel are trained and qualified	Acquirer SA Mgr	X				Class C Procedure (PPP Step 2) Class C Procedure (PMP Overall) Class C Procedure (SAP Step 3)
	5.3.1.4	Assure provider software assurance personnel are trained and qualified	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
Contract	5.4	*Not a requirement*	N/A					

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
Implementation, Development	5.4.1	The software assurance manager shall perform the following tasks:						
	5.4.1.1	Assure both acquirer and provider software assurance organizations perform according to their plans	Acquirer SA Mgr	X				Class C Procedure (AMP Step 1) Class C Procedure (SAP Step 3)
	5.4.1.2	Verify provider has developed and maintained processes for assurance of COTS, MOTS, and GOTS software	Acquirer SA Mgr	X				Class C Procedure (APP Step 1)
	5.4.1.3	Ensure insight performed over provider	Acquirer SA Mgr	X				Class C Procedure (AMP Step 1) Class C Procedure (AMP Step 2) Class C Procedure (SAP Steps 3 through 6)
	5.4.1.4	Ensure oversight performed over provider	Acquirer SA Mgr	X				Class C Procedure (AMP Step 1) Class C Procedure (AMP Step 2) Class C Procedure (SAP Steps 3 through 6)
	5.4.1.5	Assure proper software configuration management	Acquirer SA Mgr	X				Class C Procedure (SEP Step 7) Class C Procedure (AMP Step 6) Class C Procedure (SAP Step 4)
	5.4.1.6	Assure software issues are documented and tracked to resolution	Acquirer SA Mgr	X				Class C Procedure (AMP Step 4) Class C Procedure (SAP Step 6)
	5.4.1.7	Assure software products are reviewed and assure that software quality metrics are collected	Acquirer SA Mgr	X				Class C Procedure (APP Step 8) Class C Procedure (SAP Step 5)
Acceptance	5.5	*Not a requirement*	N/A					
	5.5.1	The software assurance manager shall perform the following tasks:						
	5.5.1.1	Ensure an acceptance audit is performed prior to delivery	Acquirer SA Mgr	X				Class C Procedure (SEP Step 7) Class C Procedure (AMP Step 6) Class C Procedure (SAP Step 4)

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
	5.5.1.2	Ensure that any acquirer facilities are prepared to receive and install the software	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
	5.5.1.3	Assure all acceptance documentation is complete	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
	5.5.1.4	Assure acquisition lessons learned are recorded and entered into the NASA lessons learned database	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
Operation	5.6	*Not a requirement*	N/A					
	5.6.1	The software assurance manager shall perform the following tasks:						
	5.6.1.1	Ensure software assurance processes are in place for operation of the software developed or acquired by NASA	Acquirer SA Mgr	X				Class C Procedure (SAP Step 2)
	5.6.1.2	Ensure software assurance processes include a periodic audit of the operational software	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
	5.6.2	Ensure software configuration management of operational software	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
Maintenance	5.7	*Not a requirement*	N/A					
	5.7.1	The software assurance manager shall perform the following tasks:						
	5.7.1.1	Ensure software assurance processes are in place for software maintenance.	Acquirer SA Mgr	X				Class C Procedure (SAP Step 2)
	5.7.1.2	Assure transfer and maintenance of any licenses, simulators, models, and test suites	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
	5.7.1.3	Assure that any software metrics are transferred to the maintenance organization and maintained	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
Retirement	5.8	*Not a requirement*	N/A					

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
	5.8.1	The software assurance manager shall perform the following tasks:						
	5.8.1.1	Assure that software engineering and management prepare, approve, and execute a retirement plan.	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
	5.8.1.2	Ensure that the retirement plan includes archival or disposal of software assurance records and documents	Acquirer SA Mgr				X	Medium/Medium software assurance level of effort/priority
Provider Software Assurance	6	*Not a requirement*	N/A					
Software Assurance Program	6.1	*Not a requirement*	N/A					
	6.1.1	Plan, document, and implement software assurance program	Provider SA Mgr	X				Class C Procedure (APP Step 2)
	6.1.2	Include software assurance processes for COTS, MOTS, and GOTS software	Provider SA Mgr	X				Class C Procedure (APP Step 1)
	6.1.3	Include all software assurance disciplines	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.1.4	Coordinate with IV&V	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.1.5	Describe SA metrics collection and reporting	Provider SA Mgr	X				Class C Procedure (APP Step 8) Class C Procedure (SAP Step 5)
Software Assurance Management	6.2	*Not a requirement*	N/A					
	6.2.1	Identify provider software assurance manager	Provider Mgmt				X	Medium/Medium software assurance level of effort/priority
	6.2.2	Establish and maintain interface between software assurance and project	Provider Mgmt Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
	6.2.3	Establish an independent reporting channel to provider management	Provider Mgmt Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.2.4	Conduct and document periodic reviews of provider software assurance process	Provider Mgmt Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.2.5	Conduct and document periodic reviews, audits, and assessments of the development process and products	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.2.6	Assure software problems and risks are documented and tracked to resolution	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
Software Assurance Plan	6.3	*Not a requirement*	N/A					
	6.3.1	Establish and maintain a software assurance plan	Provider Mgmt Provider SA Mgr	X				Class C Procedure (APP Step 2)
	6.3.2	The software assurance plan shall:						
	6.3.2.1	Conform plan to IEEE 730-2002	Provider Mgmt Provider SA Mgr	X				Class C Procedure (APP Step 2)
	6.3.2.2	Implement requirements of provider software assurance and software assurance disciplines sections into plan	Provider Mgmt Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.3.2.3	Give precedence of software assurance Standard sections over IEEE 730-2002	Provider Mgmt Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
Software Assurance Plan Change Procedures	6.4	*Not a requirement*	N/A					
	6.4.1	Submit plan deviations or changes formally to acquirer	Provider SA Mgr	X				Class C Procedure (AMP Step 2)
	6.4.2	Perform and submit risk analysis of deviations or changes to plan	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
Software Assurance Approval Authority	6.5	Have approval authority on the establishment and composition of all software baselines and any changes to the baselines	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
Software Assurance Records	6.6	*Not a requirement*						
	6.6.1	Prepare, maintain, and manage configuration of software assurance records	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.6.2	Include recommended preventive measures, corrective actions, and lessons learned in software assurance records	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority.
Software Assurance Status Reporting	6.7	*Not a requirement*	N/A					
	6.7.1	Prepare software assurance status reports	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
Training	6.8	*Not a requirement*	N/A					
	6.8.1	Ensure that software assurance personnel are trained and/or experienced	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.8.2	Obtain software assurance training for management, engineering, and software assurance personnel	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.8.3	Ensure software assurance personnel training is current with assurance and development methods	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.8.4	Ensure that software assurance personnel are trained for their assigned environment	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.8.5	Ensure training records are available and maintained	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
Subcontracto	6.9	*Not a requirement*	N/A					

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
r Controls	6.9.1	Flow down the requirements of this Standard to all subcontractors	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	6.9.2	Assure that the subcontractors satisfy the flowed down requirements	Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
Disciplines	7	*Not a requirement*	N/A					
Software Quality - Product Assurance	7.1	*Not a requirement*	N/A					
	7.1.1	Product assurance shall be performed to assure that:						
	7.1.1.1	All of the required plans are documented, adhere to applicable standards and procedures, are mutually consistent, and are being executed.	Acquirer and Provider SA Engr	X				Class C Procedure (PPP Overall) Class C Procedure (PMP Step 1) Class C Procedure (APP Step 2) Class C Procedure (SAP Steps 2 through 3)
	7.1.1.2	All software requirements are defined, traceable from one life cycle phase to another, and analyzed	Acquirer and Provider SA Engr	X				Class C Procedure (SEP Step 1) Class C Procedure (APP Step 3) Class C Procedure (AMP Step 3)
	7.1.1.3	Evaluate software products and related documentation	Acquirer and Provider SA Engr	X				Class C Procedure (AMP Step 2)
	7.1.1.4	Project documentation and any changes to them have been reviewed for impact to the quality of the product	Acquirer and Provider SA Engr	X				Class C Procedure (PMP Step 2) Class C Procedure (AMP Step 2) Class C Procedure (SAP Steps 2 through 3)
	7.1.1.5	Witness formal and acceptance-level software testing	Acquirer and Provider SA Engr				X	Medium/Medium software assurance level of effort/priority
	7.1.1.6	Update, audit, and/or review lower level testing results and development folders	Acquirer and Provider SA Engr				X	Medium/Medium software assurance level of effort/priority
	7.1.1.7	Software quality metrics are in place and are used to ensure the quality and safety of the software products.	Acquirer and Provider SA Engr	X				Class C Procedure (PPP Step 2) Class C Procedure (APP Step 8) Class C Procedure (SAP Step 5)

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
	7.1.1.8	Specify standards and procedures for management, acquisition, engineering, and assurance activities	Acquirer and Provider SA Engr	X				Class C Procedure (PPP Step 2) Class C Procedure (APP Step 6)
	7.1.1.9	Verify software is compliant with functional and performance requirements	Acquirer and Provider SA Engr	X				Class C Procedure (SEP Step 5) Class C Procedure (AMP Step 4) Class C Procedure (SAP Step 6)
	7.1.1.10	Present the status and quality of the software at formal reviews	Acquirer and Provider SA Engr/SA Mgr	X				Class C Procedure (PMP Step 2)
	7.1.1.11	Report problems with software products at formal and informal reviews	Acquirer and Provider SA Engr/SA Mgr	X				Class C Procedure (PMP Step 2)
Software Quality - Process Assurance	7.1.2	Process assurance shall be performed to assure that:						
	7.1.2.1	Those software life cycle processes employed for the project adhere to the applicable plans.	Acquirer and Provider SA Engr	X				Class C Procedure (PPP Step 2) Class C Procedure (PMP Step 1) Class C Procedure (APP Step 6) Class C Procedure (AMP Step 1) Class C Procedure (SAP Step 3)
	7.1.2.2	Document, track, and resolve problems found with the implementation of software life cycle processes	Acquirer and Provider SA Engr/SA Mgr	X				Class C Procedure (PMP Step 1 through 3) Class C Procedure (AMP Step 1 through 2) Class C Procedure (SAP Step 3) Class C Procedure (SAP Step 10)
	7.1.2.3	The software engineering practices, development environment, test environment, and libraries employed for the project adhere to applicable standards and procedures.	Acquirer and Provider SA Engr				X	Medium/Medium software assurance level of effort/priority
	7.1.2.4	Formal reviews and inspections are monitored and address software quality issues.	Acquirer and Provider SA Engr	X				Class C Procedure (PMP Step 2)

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
	7.1.2.5	Audit all management, engineering, and assurance processes for compliance with applicable plans.	Acquirer and Provider SA Engr	X				Class C Procedure (SAP Step 3)
	7.1.2.6	Assess the software quality metrics process for compliance to appropriate documentation or requirements.	Acquirer and Provider SA Engr				X	Medium/Medium software assurance level of effort/priority
Software Safety	7.2	*Not a requirement*	N/A					
	7.2.1	Implement the requirements for NASA-STD-8719.13, NASA Software Safety Standard	Acquirer and Provider	X				Class C Procedure (SCS) Class C Procedure (SAP Step 7)
	7.2.2	Coordinate software safety tasks between system safety personnel and software safety personnel	Acquirer and Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	7.2.3	Communicate any safety risks to the appropriate safety organization	Acquirer and Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
	7.2.4	Conduct periodic reviews and/or audits for compliance with the defined software safety process	Acquirer and Provider SA Mgr				X	Medium/Medium software assurance level of effort/priority
Software Reliability	7.3	*Not a requirement*	N/A					
	7.3.1	Assure that fault tolerance and redundancy have been specified, implemented correctly, and verified by testing.	Acquirer and Provider SA Engr				X	Medium/Medium software assurance level of effort/priority
	7.3.2	Include in appropriate status reports, software reliability analyses, and measurements	Acquirer and Provider SA Engr				X	Medium/Medium software assurance level of effort/priority
	7.3.3	Maintain the collection and classification of defects found during/from software assurance and programmatic/project formal and informal reviews	Acquirer and Provider SA Engr	X				Class C Procedure (PMP Step 6) Class C Procedure (SEP Step 5) Class C Procedure (AMP Step 4) Class C Procedure (SAP Step 5)

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
	7.3.4	Document, monitor, analyze, and track the use of software quality metrics during each stage of development and across development and operational phases	Acquirer and Provider SA Engr	X				Class C Procedure (PMP Step 6) Class C Procedure (SEP Step 5) Class C Procedure (AMP Step 4) Class C Procedure (SAP Step 5)
	7.3.5	Perform trend analyses on software quality metrics	Acquirer and Provider SA Engr				X	Medium/Medium software assurance level of effort/priority
Software Verification and Validation	7.4	*Not a requirement*	N/A					
	7.4.1	Assure that software verification and validation activities occur according to established plans, policies, procedures, and standards.	Acquirer and Provider SA Engr	X				Class C Procedure (PPP Step 3) Class C Procedure (APP Step 2) Class C Procedure (SAP Step 2)
	7.4.2	Participate in the formal and informal reviews.	Acquirer and Provider SA Engr	X				Class C Procedure (SEP Step 5) Class C Procedure (AMP Step 4) Class C Procedure (SAP Step 6)
	7.4.3	Witness or review/audit results of software testing and demonstration.	Acquirer and Provider SA Engr	X				Class C Procedure (SEP Step 5) Class C Procedure (AMP Step 4) Class C Procedure (SAP Step 6)
	7.4.4	Collect and use defect data to analyze software quality metrics.	Acquirer and Provider SA Engr	X				Class C Procedure (SEP Step 5) Class C Procedure (AMP Step 4) Class C Procedure (SAP Step 5)
	7.4.5	Collect and maintain software quality records showing the participation of software assurance staff in verification and validation efforts	Acquirer and Provider SA Engr				X	Medium/Medium software assurance level of effort/priority
	7.4.6	Provide objective evidence to the project and NASA SMA of the software's readiness for operational release.	Acquirer and Provider SA Mgr	X				Class C Procedure (SAP Step 8)
Independent	7.5	*Not a requirement*	N/A					

NASA-STD-8739.8 Requirements Compliance Matrix								
Section	**No.**	**Requirement**	**Role/ Responsibility***	**Compliance**				**Comments**
				Full	**Partial**	**None**	**N/A**	
Verification and Validation	7.5.1	All software projects that are identified as safety-critical or software Class A by the Software Assurance Classification Assessment shall be candidates for IV&V with safety criticality as the highest criterion.	IV&V	X				Class C Procedure (SCS) Class C Procedure (SAP Step 7)
	7.5.2	IV&V work shall be performed by the contractors selected and managed by the IV&V Facility.	IV&V				X	Medium/Medium software assurance level of effort/priority
	7.5.3	When the IV&V function is required, the provider shall provide all required information to NASA IV&V Facility personnel. (This requirement includes specifying on the contracts and subcontracts, IV&V's access to system and software products and personnel.)	Provider Mgmt				X	Medium/Medium software assurance level of effort/priority
	7.5.4	The IV&V Facility shall initially conduct a planning and scoping exercise to determine the specific software components to be analyzed and the tasks to be performed. The IV&V approach will be documented in an IV&V plan.	IV&V				X	Medium/Medium software assurance level of effort/priority
	7.5.5	The IV&V team shall provide input to the appropriate software assurance personnel, as well as provide feedback to the project manager as agreed in the IV&V Plan.	IV&V				X	Medium/Medium software assurance level of effort/priority

SCS - ARC Software Class Procedure, Safety Critical Software Section.
PPP - ARC Software Class Procedure, Project Planning Sub-Procedure.
PMP - ARC Software Class Procedure, Project Management Sub-Procedure.
SEP - ARC Software Class Procedure, Software Engineering Sub-Procedure.
APP - ARC Software Class Procedure, Acquisition Planning Sub-Procedure.
AMP - ARC Software Class Procedure, Acquisition Management Sub-Procedure.

SAP - ARC Software Class Procedure, Software Assurance Sub-Procedure.

Appendix G – ARC Software Documentation Standards

G.1 ARC Software Project Plan Standard

The Software Project Plan establishes the purpose and goals of the project and describes how they will be achieved. It is the controlling document for managing a software project. It defines the technical and managerial processes that will be employed to develop software work products that satisfy the product requirements. In addition to defining the work, the plan provides the basis for periodically reviewing and tracking progress against the plan. This plan describes the software to be produced, project documentation, project schedules, organization, resource requirements and constraints, and general and detailed software development activities. The Software Project Plan shall contain:

a. The classifications of the software (NPR Software Class, Software Safety Criticality, Software Assurance Level of Effort/Priority).
b. A description of the engineering environment (for development, operation, or maintenance, as applicable), including test environment, library, equipment, facilities, standards, procedures, and tools.
c. Results of trade studies concerning options for obtaining the software by means of acquiring off-the-self software, developing the software internally, developing the software via contract, enhancement to existing software, or some combination thereof.
d. A description of the software and documents to be developed, and their associated tasks, budget, staffing, and schedule.
e. A list of project deliverables.
f. A description of how the quality characteristics of the software products or services will be managed.
g. A description of how the safety, security, privacy, and other critical requirements of the software products or services will be managed.
h. User (customer) involvement from project formulation through retirement.
i. Risk management provisions to be employed.
j. Approval required by such means as regulations, required certifications, proprietary, usage, ownership, warranty, and licensing rights.
k. A definition of the process for tracking and reporting progress relative to the plan, and the process for determining the need for re-planning.
l. A description of the software life cycle model to be followed, including description of software integration processes, hardware/software integration processes, and software delivery
m. Software metrics to be tracked.

For Class C Software, the Software Project Plan shall also include:

n. Project organizational structure, including external organizations (i.e., Safety and Mission Assurance, Independent Verification and Validation (IV&V), Independent Technical Authority (ITA), NASA Engineering and Safety Center (NESC)).

o. Work breakdown structure of the life cycle processes and activities, including non-deliverable items to be performed, physical resources, and software size.
p. Software acquisition plans
q. Contractor management, including contractor selection and involvement between the subcontractor and the acquirer, if any.
r. Training of personnel, including project unique software training needs.
s. Peer review/inspection process of software work products and services. Peer reviews to be performed.

G.2 ARC Software Verification and Validation Plan Standard

The Software Verification and Validation Plan describes the processes that determine whether the products/services of all project activities conform to their requirements and whether the products/services satisfy their intended use and the customer needs. The Software Verification and Validation Plan also provides an overview of software testing, test schedules, and test management procedures. The plan describes the software component level testing, software integration testing, software qualification testing, and system qualification testing of software systems. The Software Verification and Validation Plan shall contain:

a. Identification of selected work products to be verified, and the verification method. (e.g., peer reviews of requirements and test plans; peer reviews/inspections of critical code; testing code against requirements and design).
b. Identification of selected work products to be validated, and the validation method (e.g., user groups reviewing requirements and prototypes; acceptance testing; operational demonstrations).
c. Acceptance criteria
d. Test plans:
    - Description of testing approach.
    - Test types (e.g., unit testing, software integration testing, software systems integration testing, software/hardware testing, end-to-end testing, qualification testing, acceptance testing, regression testing).
    - Data recording, reduction, and analysis.
    - Test coverage (breadth and depth) or other methods for ensuring sufficiency of testing.
    - Test schedules.
    - Test reporting procedures.

For Class C Software, the Software Verification and Validation Plan shall also include:

e. Identification of selected software verification procedures and criteria across the life cycle (e.g., peer review procedures, inspection procedures, re-inspection criteria, testing procedures).
f. Identification of where actual software verification records and results analysis will be documented (e.g., test records, peer review records, inspection records), and where software verification corrective action will be documented.

g. Identification of selected software validation procedures and criteria across the life cycle (e.g., prototyping, user groups, simulation, analysis, acceptance testing, operational demonstrations).
h. Identification of where actual software validation records and results analysis will be documented (e.g., user group records, prototyping records, acceptance testing records), and where software validation corrective action will be documented.
i. Test plans:
    - Test classes (e.g., timing tests, erroneous input tests, maximum capacity tests).
    - General test conditions (e.g., conditions that apply to all of the tests or to a group of tests). For example: "Each test shall include nominal, maximum, and minimum values;" "each test of type x shall use live data;" "execution size and time shall be measured for each CSCI.".
    - Test progression (e.g., the planned sequence or progression of tests).
    - Planned tests cases (e.g., the scope of planned testing).
    - Requirements traceability (or verification matrix).
    - Qualification testing environment, site, personnel, and participating organizations.

G. 3 ARC Software Maintenance Plan Standard

The Software Maintenance Plan provides insight into the method, approach, responsibility, and processes to be followed for maintenance of software and its associated documentation. For the Software Maintenance Plan, provide separate volumes for each system element (e.g., ground operations, flight operations, mission operations, and spacecraft). The Software Maintenance Plan shall contain:

a. Planning information for the following activities:
    (1) Change request (problems, enhancements) reporting
    (2) Change request analysis.
    (3) Change implementation.
    (4) New version review/acceptance.
    (5) Procedures for migrating to the new version.
    (6) Software retirement.
    (7) Software assurance.
b. Specific standards, methods, tools, actions, procedures, and responsibilities associated with the maintenance process.
c. The following elements:
    (1) Development and tracking of required upgrade intervals,
    (2) Approach for the scheduling, implementation, and tracking of software upgrades.
    (3) Equipment and labs required for software verification and implementation.
    (4) Approach for the implementation of modifications to operational software (e.g., testing of software in development lab prior to operational use).
    (5) Approach for software delivery process including distribution to facilities and users of the software products and installation of the software in the target environment (including, spacecraft, simulators, mission control center, and ground operations facilities).

(6) Approach for providing NASA access to the software version description data

G.4 ARC Software Requirements Specification Standard

The Software Requirements Specification defines the software performance, interface, operational, and quality assurance requirements for each CSCI. The Software Requirements Specification shall contain:

a. Scope

Create the shared vision of the software for all relevant shareholders. Thus, scope includes needs, goals, objectives, missions or business case, high-level operational concepts, major assumptions, constraints, and authority and responsibility.

b. System overview.

The system overview includes the operational concepts of the software. Operational concepts are scripts describing how a product will be used, manufactured, tested, installed, stored, and decommissioned. Operational concepts may be referred to as "use cases", "operations plans", "design reference missions", or "scenarios". Operational concepts builds consensus among all stakeholders, facilitates complete and consistent requirements, identifies user interface issues, offers early opportunity for early validation, and forms the foundation for testing scenarios in product verification. The system overview also identifies the software interfaces (external and internal). Identifying interfaces will clarify scope, aid risk assessment, and reduce rework.

c. CSCI requirements.
   (1) Functional requirements.
   (2) Required states and modes.
   (3) External interface requirements.
   (4) Safety requirements.
   (5) Performance and timing requirements.
   (6) Security and privacy requirements.
   (7) Environment requirements.
   (8) Computer resource requirements.
      (a) Computer hardware resource utilization requirements.
      (b) Computer software requirements.
      (c) Computer communications requirements.
   (9) Software quality characteristics.
   (10) Design and implementation constraints.
   (11) Personnel-related requirements.
d. Requirements partitioning for phased delivery, if applicable.

For Class C Software, the Software Requirements Specification shall also include:

e. CSCI requirements.
   (12) Internal interface requirements.

(13) Internal data requirements.
(14) Adaptation requirements.
(15) Training-related requirements.
(16) Packaging requirements.

f. Qualification provisions.
g. Requirements traceability and verification data.

Note: Software requirements and design specifications need not be textual, and may include representations in rigorous specification languages, graphical representations, or specifications suitable for requirements or design analysis tools or methodologies,

G.5 ARC Software Design Description Standard

The Software Design Description defines the logic and data structures of the software. It provides information on functions and algorithms to be used, design constraints, and rationale for design decisions. The Software Design Description shall contain:

a. CSCI architectural design.
b. CSCI decomposition and interrelationship between components.
   (1) CSCI components:
      - Description of how the software item satisfies the software requirements, including algorithms, data structures, and functional decomposition.
      - Software item input/output description.
      - Static/architectural relationship of the software units.

For the Class C Software, the Software Design Description shall also include:

c. CSCI decomposition and interrelationship between components.
   (1) CSCI components:
      - Concept of execution including data flow, control flow, and timing.
      - Requirements traceability.
      - CSCI's planned utilization of computer hardware resources.
   (2) Rationale for software item design/trade decisions including assumptions, limitations, safety and reliability related items/concerns or constraints.

G.6 ARC Software Interface Design Description Standard

The Software Interface Design Description defines the characteristics of the interaction of two or more systems, subsystems, components, or other software elements. The Interface Design Description shall contain:

a. Type of interface (i.e., real-time data transfer, storage-and-retrieval of data) to be implemented.
b. Specification of individual data elements, format, and data content
c. Specification of communication methods for the interface.
d. Specification of protocols for the interface.

For the Class C Software, the Software Interface Design Description shall also include:

e. Identification of external interface, software component, and software unit

G.7 ARC Software Metrics Report Standard

The Software Metrics Report provides and meets the information needs/objectives of the project, as defined in the project plan. The report shows data that gives an insight into the state and characteristics of the project. The Software Metrics Report shall contain the following measures on a CSCI basis, as appropriate for the current phase of the project:

- Size (how big is the product, and how much has been completed)
- Schedule (dates)
- Effort (hours)
- Cost ($)
- Defects (problem reports, change requests, review item discrepancies, findings)

Based on the measures, Software Metrics Report shall also contain following measurement results:

a. Progress tracking
b. Functionality
c. Productivity
d. Quality

An example set of progress tracking:

- Earned value / Schedule
- Earned value / Cost
- Earned value / Size

An example set of functionality:
- Number of requirements included in a completed build/release (planned vs. actual)
- Number of function points in the software (planned vs. actual)
- Computer resource utilization in percentage of capacity

An example set of productivity:
- Size / Effort
- Size / Schedule
- Size / Cost

An example set of quality:
- Defect / Size

Appendix H– Ames Engineering Process Group Charter

H.1. Purpose

The purpose of this Charter is to establish the Ames Engineering Process Group (AEPG) for Ames Research Center (ARC), as called for in the NASA Software Engineering Initiative Implementation (NSEI) Improvement Plan (NPR 7150.2, SWE-003). This charter defines the mission, responsibilities, membership, and conduct of operations for the AEPG.

H.2. Scope

This Charter applies to all NASA organizations and personnel located at Ames Research Center, Moffett Field CA.

H.3. Authority

Director of Project Management and Engineering, Ames Research Center
Chief Engineer, Ames Research Center

H.4. Mission

The mission of the AEPG is to act as the focal point for the Software Process Improvement (SPI) implementation activities at ARC. It is responsible for and facilitates the activities that relate to software process improvement, such as action planning, process improvement, technology improvement, and other activities. It coordinates, plans, and leads ARC SPI activities required to implement and maintain the ARC Software Engineering Improvement Plan in accordance with guidance provided by the Director of Project Management and Engineering and the Chief Engineer. The AEPG maintains an organizational awareness of the overall SPI effort, and serves as a facilitator to ensure the successful completion of SPI activities. It will arrange for or conduct training in process improvement and continuing education in other subjects related to SPI.

The AEPG supports line managers and development projects by providing consultation when required. It will facilitate planned process assessments, and baselining activities to provide definition for process definition and measurement activities. It will also monitor SPI activities at ARC, and will report the status of SPI activities in progress to the Director of Project Management and Engineering and the Chief Engineer.

The AEPG will support the Center's direction of having and demonstrating lean software processes. The AEPG will support the ATAAC software classification of programs and projects.

H.5. Responsibilities

The AEPG's primary responsibilities are to:

- Establish, train, and facilitate pilot projects that will define and document standard software project management processes.
- Identify, author, and submit (for management approval) organizational policies for software project management processes.
- Facilitate the establishment of pilot projects that will test new ARC processes and procedures, address project problems, and achieve measurable benefits (e.g., ROI).
- Facilitate the identification of appropriate process/product performance metrics and facilitate development of documented data collection and measurement processes.
- Develop mechanisms that will foster accelerated adoption of new project management processes by ARC.
- Establish effective communication mechanisms that will facilitate understanding of the current status of software-related practices at ARC.
- Establish a library of ARC software process assets that will be used to facilitate organizational learning and reuse.
- Construct a process database that is a permanent repository for performance metrics gathered on the software engineering processes and products.
- Serve as the focal point for process training, process consultation, and technology insertion.
- Review and concur on the project software classification determination.
- Support the ATAAC decisions regarding project software classification disagreements.

H.6. Membership

AEPG membership will consist of, as a minimum, representatives from all directorates that have software:

- Aerospace Directorate, Code A
- Center Operations Directorate, Code J
- Program Management and Engineering Directorate, Code P
- Safety, Environmental, and Mission Assurance Directorate, Code Q
- Science Directorate, Code S
- Exploration Technology Directorate, Code T

A representative from Software Quality Assurance is required by the NASA Software Engineering Initiative and may act as, or in addition to, the Code Q representative. The Director of Project Management and Engineering and the Chief Engineer will approve the AEPG Charter and membership, and will appoint the AEPG Lead.

H.7. Associate Membership

The Leads of the Pilot Projects may be non-voting members of the AEPG. Other associate memberships may be established to facilitate key activities such as training, or relationships such as with the Systems Management Office. These will be approved by the AEPG.

H.8. Conduct of Operations

The AEPG will meet weekly at a place and time announced by the AEPG Lead, or as called for by the AEPG Lead.

H.9. Termination

Not applicable.